

**Amendments to the Claims**

1           1.       (previously presented) A shadow rendering method, the method comprising  
2   the steps of:  
3           providing observer data of a simulated multi-dimensional scene;  
4           providing lighting data associated with a plurality of simulated light sources arranged  
5   to illuminate said scene, said lighting data including light image data;  
6           for each of said plurality of light sources, comparing at least a portion of said  
7   observer data with at least a portion of said lighting data to determine if a modeled point  
8   within said scene is illuminated by said light source and storing at least a portion of said light  
9   image data associated with said point and said light source in a light accumulation buffer;  
10   and then  
11          combining at least a portion of said light accumulation buffer with said observer data;  
12   and  
13   outputting resulting image data.

14  
15   Claims 2-48 (cancelled)

16  
17          49.       (previously presented) The method as recited in Claim 1, wherein said  
18   observer data includes observed color data and observed depth data associated with a  
19   plurality of modeled polygons within said scene as rendered from an observer's perspective.

20           50.     (previously presented) The method as recited in Claim 49, wherein said  
21     plurality of modeled polygons within said scene are associated with at least one pixel, such  
22     that said observed color data includes an observed red-green-blue value for said pixel and  
23     said observed depth data includes an observed z-buffer value for said pixel.

24           51.     (previously presented) The method as recited in Claim 49, wherein said  
25     lighting data includes source color data associated with at least one of said light sources and  
26     source depth data associated with said plurality of modeled polygons within said scene as  
27     rendered from a plurality of different light source's perspectives.

28           52.     (previously presented) The method as recited in Claim 51, wherein said  
29     plurality of modeled polygons within said scene are associated with at least one pixel, such  
30     that said source color data includes a source red-green-blue value for said pixel and said  
31     source depth data includes a source z-buffer value for said pixel.

32           53.     (previously presented) The method as recited in Claim 51, wherein the step of  
33     comparing at least a portion of said observer data with at least a portion of said lighting data  
34     to determine if a modeled point within said scene is illuminated by said light source further  
35     includes comparing at least a portion of said observed depth data with at least a portion of  
36     said source depth data to determine if said modeled point is illuminated by said light source.

37           54.     (previously presented) The method as recited in Claim 53, wherein the step of  
38     comparing at least a portion of said observed depth data with at least a portion of said source  
39     depth data to determine if said modeled point is illuminated by said light source further  
40     includes converting at least a portion of said observed depth data from said observer's

perspective to at least one of said plurality of different light source's perspectives, before  
comparing said observed depth data with said source depth data.

55. (previously presented) The method as recited in Claim 54, wherein the step of  
converting at least a portion of said observed depth data from said observer's perspective to  
at least one of said plurality of different light source's perspectives further includes using a  
precalculated matrix transformation look-up table for at least one of said plurality of light  
sources, when said light source has a fixed perspective of said scene.

56. (previously presented) The method as recited in Claim 49, wherein at least a  
portion of said source color data is selectively controlled source color data that can be  
changed over a period of time during which at least the step of outputting the resulting image  
data is repeated a plurality of times.

57. (previously presented) The method as recited in Claim 56, wherein said  
controlled source color data includes data selected from a set comprising motion picture data,  
video data, animation data, and computer graphics data.

58. (previously presented) An arrangement configured to render shadows in a  
simulated multidimensional scene, the arrangement comprising:

an output to a display screen configured to display image data;  
memory for storing data including observer data associated with a simulated multi-  
dimensional scene, and lighting data associated with a plurality of simulated light sources  
arranged to illuminate said scene, said lighting data including light image data, said memory  
further including a light accumulation buffer portion and a frame buffer portion;

at least one processor coupled to said memory and said output and operatively configured to, for each of said plurality of light sources, compare at least a portion of said observer data with at least a portion of said lighting data to determine if a modeled point within said scene is illuminated by said light source and storing at least a portion of said light image data associated with said point and said light source in said light accumulation buffer, then combining at least a portion of said light accumulation buffer with said observer data, and storing resulting image data in said frame buffer, and outputting at least a portion of said image data in said frame buffer via said output.

59. (previously presented) The arrangement as recited in Claim 58, wherein said observer data includes observed color data and observed depth data associated with a plurality of modeled polygons within said scene as rendered from an observer's perspective.

60. (previously presented) The arrangement as recited in Claim 59, wherein said plurality of modeled polygons within said scene are associated with at least one pixel on said display screen, such that said observed color data includes an observed red-green-blue value for said pixel and said observed depth data includes a observed z-buffer value for said pixel.

61. (previously presented) The arrangement as recited in Claim 59, wherein said lighting data includes source color data associated with at least one of said light sources and source depth data associated with said plurality of modeled polygons within said scene as rendered from a plurality of different light source's perspectives.

62. (previously presented) The arrangement as recited in Claim 61, wherein said plurality of modeled polygons within said scene are associated with at least one pixel, such

that said source color data includes a source red-green-blue value for said pixel and said source depth data includes a source z-buffer value for said pixel.

63. (previously presented) The arrangement as recited in Claim 61, wherein said processor is further configured to compare at least a portion of said observed depth data with at least a portion of said source depth data to determine if said modeled point is illuminated by said light source.

64. (previously presented) The arrangement as recited in Claim 63, wherein said processor is further configured to convert at least a portion of said observed depth data from said observer's perspective to at least one of said plurality of different light source's perspectives, before comparing said observed depth data with said source depth data.

65. (previously presented) The arrangement as recited in Claim 64, wherein said memory further includes at least one precalculated matrix transformation table associated with at least one of said plurality of light sources, and said processor is further configured to use said precalculated matrix transformation look-up table when said light source is simulated as having a fixed perspective of said scene.

66. (previously presented) The arrangement as recited in Claim 61, wherein said processor is further configured to selectively control at least a portion of said source color data over a period of time.

67. (previously presented) The arrangement as recited in Claim 66, wherein said controlled source color data includes data selected from a set comprising motion picture data, video data, animation data, and computer graphics data.

104           68.   (previously presented) A computer-readable medium carrying at least one set  
105   of computer instructions configured to cause a computer to operatively simulate light falling  
106   on a modeled object in a computer generated multi-dimensional graphics simulation by  
107   performing operations comprising:

108           a)    rendering an observer view of at least a portion of a spatially modeled object  
109   as a plurality of observed depth values and observed image values;

110           b)    rendering a source view of at least a portion of said modeled object as a  
111   plurality of source depth values and a plurality of source image values;

112           c)    transforming at least a portion of said observed depth values to said source  
113   view;

114           d)    modifying at least one image accumulation value with one of said observed  
115   image values if said corresponding transformed observer value is equal to a comparable one  
116   of said source depth values;

117           e)    multiplying said one of said observed image values by said at least one image  
118   accumulation value to produce at least one pixel value; and

119           f)    output said pixel value to a computer screen.

120           69.   (previously presented) The computer-readable medium as recited in Claim 68,  
121   further configured to cause tcomputer to perform the further step of:

122           g)    following step d), repeating steps b) through d) for at least one additional  
123   source view.

124           70.   (previously presented) The computer-readable medium as recited in Claim 69,  
125 further configured to cause the computer to perform the further steps of:

126           h)    repeating steps a) through g) a frame rate; and  
127           wherein step f) further includes sequentially outputting a plurality of pixels as frames  
128 of data to said computer screen at said frame rate, and said step of rendering said source view  
129 further includes changing at least one of said source image values between said subsequent  
130 frames of data.

131           71.   (previously presented) The computer-readable medium as recited in Claim 70  
132 wherein at least a portion of said source image values represent color data selected from a set  
133 comprising motion picture data, video data, animation data, and computer graphics data.

134           72.   (previously presented) The computer-readable medium as recited in Claim 70,  
135 wherein step c) further includes transforming at least a portion of said observed depth values  
136 from an observer coordinate system to a corresponding source coordinate system.

137           73.   (previously presented) The computer-readable medium as recited in Claim 72,  
138 wherein the step of transforming at least a portion of said observed depth values from an  
139 observer coordinate system to a corresponding source coordinate system further includes  
140 using a precalculated transformation table to transform directly from said observer coordinate  
141 system to said corresponding source coordinate system.

142           74.   (currently amended) A computer-readable medium carrying at least one set of  
143 computer instructions configured to cause at least one processor to operatively render  
144 simulated shadows in a multi-dimensional simulated scene by performing the steps of:

145 providing observer data of a simulated multi-dimensional scene;  
146 providing lighting data associated with a plurality of simulated light sources arranged  
147 to illuminate said scene, said lighting data including light image data;  
148 for each of said plurality of light sources, comparing at least a portion of said  
149 observer data with at least a portion of said lighting data to determine if a modeled point  
150 within said scene is illuminated by said light source and storing at least a portion of said light  
151 image data associated with said point and said light source in a light accumulation buffer;  
152 and then  
153 combining at least a portion of said light accumulation buffer with said observer data;  
154 and  
155 outputting resulting image data to a computer screen.

156 75. (previously presented) The computer-readable medium as recited in Claim 74,  
157 wherein said observer data includes observed color data and observed depth data associated  
158 with a plurality of modeled polygons within said scene as rendered from an observer's  
159 perspective.

160 76. (previously presented) The computer-readable medium as recited in Claim 75,  
161 wherein said plurality of modeled polygons within said scene are associated with at least one  
162 pixel, such that said observed color data includes an observed red-green-blue value for said  
163 pixel and said observed depth data includes a observed z-buffer value for said pixel.

164 77. (previously presented) The computer-readable medium as recited in Claim 75,  
165 wherein said lighting data includes source color data associated with at least one of said light



sources and source depth data associated with said plurality of modeled polygons within said scene as rendered from a plurality of different light source's perspectives.

78. (currently amended) The computer-readable medium as recited in Claim 75, wherein said plurality of modeled polygons within said scene are associated with at least one pixel ~~on said computer screen~~, such that said source color data includes a source red-green-blue value for said pixel and said source depth data includes a source z-buffer value for said pixel.

79. (previously presented) The computer-readable medium as recited in Claim 77, where in the step of comparing at least a portion of said observer data with at least a portion of said lighting data to determine if a modeled point within said scene is illuminated by said light source further includes comparing at least a portion of said observed depth data with at least a portion of said source depth data to determine if said modeled point is illuminated by said light source.

80. (previously presented) The computer-readable medium recited in Claim 79, where in the step of comparing at least a portion of said observed depth data with at least a portion of said source depth data to determine if said modeled point is illuminated by said light source further includes converting at least a portion of said observed depth data from said observer's perspective to at least one of said plurality of different light source's perspectives, before comparing said observed depth data with said source depth data.

81. (previously presented) The computer-readable medium as recited in Claim 80, wherein the step of converting at least a portion of said observed depth data from said

observer's perspective to at least one of said plurality of different light source's perspectives further includes using a precalculated matrix transformation look-up table for at least one of said plurality of light sources, when said light source has a fixed perspective of said scene.

82. (currently amended) The computer-readable medium as recited in Claim 77, wherein at least a portion of said source color data is selectively controlled source color data that can be changed over a period of time during which at least the step of outputting the resulting image data to ~~said computer screen~~ a display device is repeated a plurality of times.

83. (previously presented) The computer-readable medium as recited in Claim 82, wherein said controlled source color data includes data selected from a set comprising motion picture data, video data, animation data, and computer graphics data.

84. (new) A computer circuit for processing computer graphics data coupled to at least one processor to operatively render simulated shadows in a multi-dimensional simulated scene by performing steps comprising:

- a) receiving observer data of a simulated multi-dimensional scene;
- b) receiving lighting data associated with a plurality of simulated light sources arranged to illuminate said scene, said lighting data including light image data;
- c) for each of said plurality of light sources, comparing at least a portion of said observer data with at least a portion of said lighting data to determine if a modeled point within said scene is illuminated by said light source and storing at least a portion of said light image data associated with said point and said light source;

d) combining at least a portion of said stored light image data with said observer data;

and

e) transmitting resulting image data to be displayed on a computer screen.

85. (new) The computer circuit recited in claim 84, wherein said observer data includes observed color data and observed depth data associated with a plurality of modeled polygons within said scene as rendered from an observer's perspective.

86. (new) The computer circuit recited in claim 85, wherein said plurality of modeled polygons within said scene are associated with at least one pixel, such that said observed color data includes an observed red-green-blue value for said pixel and said observed depth data includes an observed z-buffer value for said pixel.

87. (new) The computer circuit recited in claim 85, wherein said lighting data includes source color data associated with at least one of said light sources and source depth data associated with said plurality of modeled polygons within said scene as rendered from a plurality of different light source's perspectives.

88. (new) The computer circuit recited in claim 85, wherein said plurality of modeled polygons within said scene are associated with at least one pixel on said computer screen, such that said source color data includes a source red-green-blue value for said pixel and said source depth data includes a source z-buffer value for said pixel.

89. (new) The computer circuit recited in claim 87, where in the step of comparing at least a portion of said observer data with at least a portion of said lighting data to determine if a modeled point within said scene is illuminated by said light source further

228 includes comparing at least a portion of said observed depth data with at least a portion of  
229 said source depth data to determine if said modeled point is illuminated by said light source.

230 90. (new) The computer circuit recited in claim 89, where in the step of  
231 comparing at least a portion of said observed depth data with at least a portion of said source  
232 depth data to determine if said modeled point is illuminated by said light source further  
233 includes converting at least a portion of said observed depth data from said observer's  
234 perspective to at least one of said plurality of different light source's perspectives, before  
235 comparing said observed depth data with said source depth data.

236 91. (new) The computer circuit recited in claim 90, wherein the step of converting  
237 at least a portion of said observed depth data from said observer's perspective to at least one  
238 of said plurality of different light source's perspectives further includes using a look-up table  
239 containing predetermined transformation values for at least one of said plurality of light  
240 sources, when said light source has a fixed perspective of said scene.

241 92. (new) The computer circuit recited in claim 87, wherein at least a portion of  
242 said source color data is selectively controlled source color data that can be changed over a  
243 period of time during which at least the step of transmitting the resulting image data to said  
244 computer screen is repeated a plurality of times.

245 93. (new) The computer circuit recited in claim 92, wherein said controlled source  
246 color data includes data selected from stored motion picture data.

247 94. (new) The computer circuit recited in claim 92, wherein said controlled source  
248 color data includes data selected from stored computer animation data.

249           95.     (new) The computer circuit recited in claim 92, wherein said controlled source  
250 color data includes data selected from stored video data.

251           96.     (new) The computer circuit recited in claim 92, wherein said controlled source  
252 color data includes data selected from stored computer graphics sequence data.

253           97.     (new) A computer circuit for processing computer graphics data coupled to a  
254 computer system to operatively render simulated shadows in a multi-dimensional simulated  
255 scene by performing steps comprising:

- 256           a) receiving observer data of a simulated multi-dimensional scene;  
257           b) receiving lighting data associated with a plurality of simulated light sources  
258 arranged to illuminate said scene, said lighting data including light image data;  
259           c) for each of said plurality of light sources, comparing at least a portion of said  
260 observer data with at least a portion of said lighting data to determine if a modeled point  
261 within said scene is illuminated by said light source and storing at least a portion of said light  
262 image data associated with said point and said light source;  
263           d) combining at least a portion of said light image data with said observer data; and  
264           e) transmitting resulting image data for display on a computer screen.

265           98.     (new) The computer circuit recited in claim 97, wherein said observer data  
266 includes observed color data and observed depth data associated with a plurality of modeled  
267 polygons within said scene as rendered from an observer's perspective.

268           99.     (new) The computer circuit recited in claim 98, wherein said plurality of  
269 modeled polygons within said scene are associated with at least one pixel, such that said

270. observed color data includes an observed red-green-blue value for said pixel and said  
271. observed depth data includes an observed z-buffer value for said pixel.

272. 100. (new) The computer circuit recited in claim 98, wherein said lighting data  
273. includes source color data associated with at least one of said light sources and source depth  
274. data associated with said plurality of modeled polygons within said scene as rendered from a  
275. plurality of different light source's perspectives.

276. 101. (new) The computer circuit recited in claim 98, wherein said plurality of  
277. modeled polygons within said scene are associated with at least one pixel on said computer  
278. screen, such that said source color data includes a source red-green-blue value for said pixel  
279. and said source depth data includes a source z-buffer value for said pixel.

280. 102. (new) The computer circuit recited in claim 100, where in the step of  
281. comparing at least a portion of said observer data with at least a portion of said lighting data  
282. to determine if a modeled point within said scene is illuminated by said light source further  
283. includes comparing at least a portion of said observed depth data with at least a portion of  
284. said source depth data to determine if said modeled point is illuminated by said light source.

285. 103. (new) The computer circuit recited in claim 102, where in the step of  
286. comparing at least a portion of said observed depth data with at least a portion of said source  
287. depth data to determine if said modeled point is illuminated by said light source further  
288. includes converting at least a portion of said observed depth data from said observer's  
289. perspective to at least one of said plurality of different light source's perspectives, before  
290. comparing said observed depth data with said source depth data.

291           104.   (new) The computer circuit recited in claim 103, wherein the step of  
292   converting at least a portion of said observed depth data from said observer's perspective to  
293   at least one of said plurality of different light source's perspectives further includes using a  
294   look-up table containing predetermined transformation values for at least one of said plurality  
295   of light sources, when said light source has a fixed perspective of said scene.

296           105.   (new) The computer circuit recited in claim 100, wherein at least a portion of  
297   said source color data is selectively controlled source color data that can be changed over a  
298   period of time during which at least the step of transmitting the resulting image data to said  
299   computer screen is repeated a plurality of times.

300           106.   (new) The computer circuit recited in claim 105, wherein said controlled  
301   source color data includes data selected from stored motion picture data.

302           107.   (new) The computer circuit recited in claim 105, wherein said controlled  
303   source color data includes data selected from stored computer animation data.

304           108.   (new) The computer circuit recited in claim 105, wherein said controlled  
305   source color data includes data selected from stored video data.

306           109.   (new) The computer circuit recited in claim 105, wherein said controlled  
307   source color data includes data selected from stored computer graphics sequence data.

308